

## NEW SPECIES AND RECORDS OF PREDACEOUS MIDGE FROM FIJI (DIPTERA: CERATOPOGONIDAE)

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**Abstract.**—Fourteen species of predaceous midges of the tribes Ceratopogonini, Heteromyiini, Sphaeromiini, and Palpomyiini are reported from Fiji, including eight species described as new: *Downeshelea stenochora*, *Monohelea beaveri*, *M. fijiensis*, *M. coloisuvae*, *M. leveri*, *Stilobezzia browni*, *Nilobezzia fijiensis*, and *Bezzia vitilevuensis*. All are new records from Fiji, from which only four species of Forcipomyiinae and two species of Culicoidinidae had previously been reported.

**Key Words:** predaceous midges, Ceratopogonidae, Fiji

The biting and predaceous midges of the family Ceratopogonidae are a conspicuous element of the Dipterous fauna of the Pacific islands. Tokunaga and Murachi (1959) recorded 147 species from Micronesia. For unknown reasons practically no collecting or taxonomic study has been done on the ceratopogonids of Fiji. Debenham (1978) made a careful listing of all the species recorded from the Australasian Region and recorded only six species from Fiji, as follows: *Atrichopogon jacobsoni* (de Meijere), *Forcipomyia fijiensis* (Macfie), *F. fuliginosa* (Meigen), *F. indecora* Kieffer, *Culicoides belkini* Wirth and Arnaud, and *C. cancri-socius* Macfie.

In this paper we report on the predaceous species of the tribes Ceratopogonini, Heteromyiini, Sphaeromiini and Palpomyiini. The species of the subfamilies Forcipomyiinae and Dasyheleinae, and the bloodsucking species of the tribe Culicoidinidae of the subfamily Ceratopogoninae will be reported on in a second paper. We here record 14 species, of which eight are new species, and all are new Fijian records.

Taxonomic characters employed for identification of adult ceratopogonids were described by Wirth et al. (1977), Downes and Wirth (1981), and particularly for the tribe Ceratopogonini by Wirth and Grogan (1988). Wing length is measured from the basal arculus to the wing tip and costal length from the basal arculus to the costal apex. Costal ratio is the costal length divided by the wing length. Antennal ratio of the female is the sum of the lengths of the elongated five distal flagellar segments divided by the sum of the lengths of the preceding eight; in the male the antennal ratio is the sum of the lengths of the elongated three distal segments divided by the sum of the lengths of the preceding 10 short segments. Palpal ratio is the length of the third palpal segment divided by its greatest breadth. Tarsal ratio is the value obtained by dividing the length of the basitarsus by the length of the second tarsomere.

The holotypes and allotypes of the new species herein described are deposited in the U.S. National Museum of Natural History in Washington, D.C. (abbreviated USNM).

Paratypes as available will be deposited in the British Museum (Nat. Hist.), London; the Museum National d'Histoire Naturelle in Paris; the Bishop Museum in Honolulu (BISH); the Australian National Insect Collection in Canberra; and the DSIR National Insect Collection in Auckland, New Zealand.

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Howard Moore, Technical Assistant at Loyola College, gave invaluable aid in the photographic work.

Subfamily Ceratopogoninae  
Tribe Ceratopogonini  
Genus *Alluaudomyia* Kieffer

**References:** Tokunaga, 1959 (New Guinea species); Tokunaga and Murachi, 1959 (Micronesian species); Wirth and Delfinado, 1964 (revision Oriental species); Debenham, 1971 (revision of Australia and New Guinea species).

*Alluaudomyia bipunctata*  
Tokunaga and Murachi

*Alluaudomyia bipunctata* Tokunaga and Murachi, 1959: 356 (male, female; Caroline Islands; fig. male wing, palpus, antenna, genitalia).

**Distribution.**—Caroline Islands: Fiji.

**New record.**—FIJI: Viti Levu, Savura Creek, v.1983, R. A. Beaver, Malaise trap, 2 females.

*Alluaudomyia tenuistylata*  
Tokunaga

*Alluaudomyia tenuistylata* Tokunaga, 1959: 296 (male; West Irian); Tokunaga, 1963: 225 (male, female; West Irian, New Guinea); Debenham, 1971: 171 (male, female redescribed; figs.; Queensland).

**Distribution.**—Fiji, New Guinea, Queensland, West Irian.

**New record.**—FIJI: Viti Levu, Savura Creek, v.1983, R. A. Beaver, Malaise trap, 2 females; 14 km w Lami, 7–10.xii.1986, R. L. and B. B. Brown, UV light trap, 1 male, 2 females.

**Genus *Downeshelea*** Wirth and Grogan

*Downeshelea* Wirth and Grogan, 1988: 50.  
Type-species, *Monohelea stonei* Wirth, by original designation.

**References** (to *Downeshelea* and *Monohelea*): Tokunaga and Murachi, 1959: 404 (Micronesian species); Tokunaga, 1963: 238 (New Guinea species); Debenham, 1972: 1 (Australia and New Guinea species); Ratanaworabhan and Wirth, 1972: 439 (Oriental species).

***Downeshelea stenochora* Wirth and Giles,  
NEW SPECIES  
Figs. 1-7, 51**

Female allotype.—Wing length 1.02 mm; breadth 0.39 mm.

**Head:** Brownish, narrow bases of antennal segments 4-10 pale. Eyes contiguous in a point, bare. Antenna (Fig. 3) with lengths of flagellar segments in proportion of 18-15-14-14-13-13-13-22-23-23-23-30; antennal ratio 1.17. Palpus (Fig. 4) dark brown, stout; lengths of segments in proportion of 4-8-14-9-13; palpal ratio 1.7. Mandible with 10 coarse teeth.

**Thorax:** Dark brown, scutellum yellowish on each end. Legs (Fig. 1) brown, paler on fore leg, dark brown on hind leg; knees conspicuously yellowish; hind femur and tibia slightly stouter. Hind leg with lengths from femur to tarsomere 5 as 88-78-50-20-10-9-12; hind basitarsus (Fig. 2) with abrupt bend near base, with one dense row of short palisade setae and a sparse row of longer setae, one strong black ventral spine at base and two slender spines at apex; tarsomeres 2-3 each with pair of slender apical spines; tarsomere 4 subcylindrical, with pair of long, strong, black spines at apex; hind claw single, simple, length 0.068 mm. Fore tarsus with slender ventral spines as follows: tarsomere 1 with one at base and two at apex; tarsomeres 2-4, one apical. Mid basitarsus with two similar spines at base and eight along length of segment; segments 2-4 each with two apical. Fore and mid claws paired, subequal, curved; elongate, length 0.043 mm on fore leg and 0.036 mm on mid leg. Wing (Fig. 51) with conspicuous pattern due to enlarged dark gray microtrichia consisting of a broad fascia across midlength at level of first radial cell, and a small subapical fascia in cell R<sub>5</sub> behind tip of costa, the two connected by a darkened area in cell M<sub>1</sub>. Costa unusually elongate, costal ratio 0.85; two radial cells, the first nearly half the length of second, rather broad, the second unusually narrow, almost slitlike distally. Halter intensely dark brown.

**Abdomen:** Dark brown; pleural membrane with microscopic striations due to rows of dense blackish spicules. Spermathecae (Fig. 5) two, subspherical with well-developed stout necks; subequal, each 0.065 by 0.038 mm including the neck.

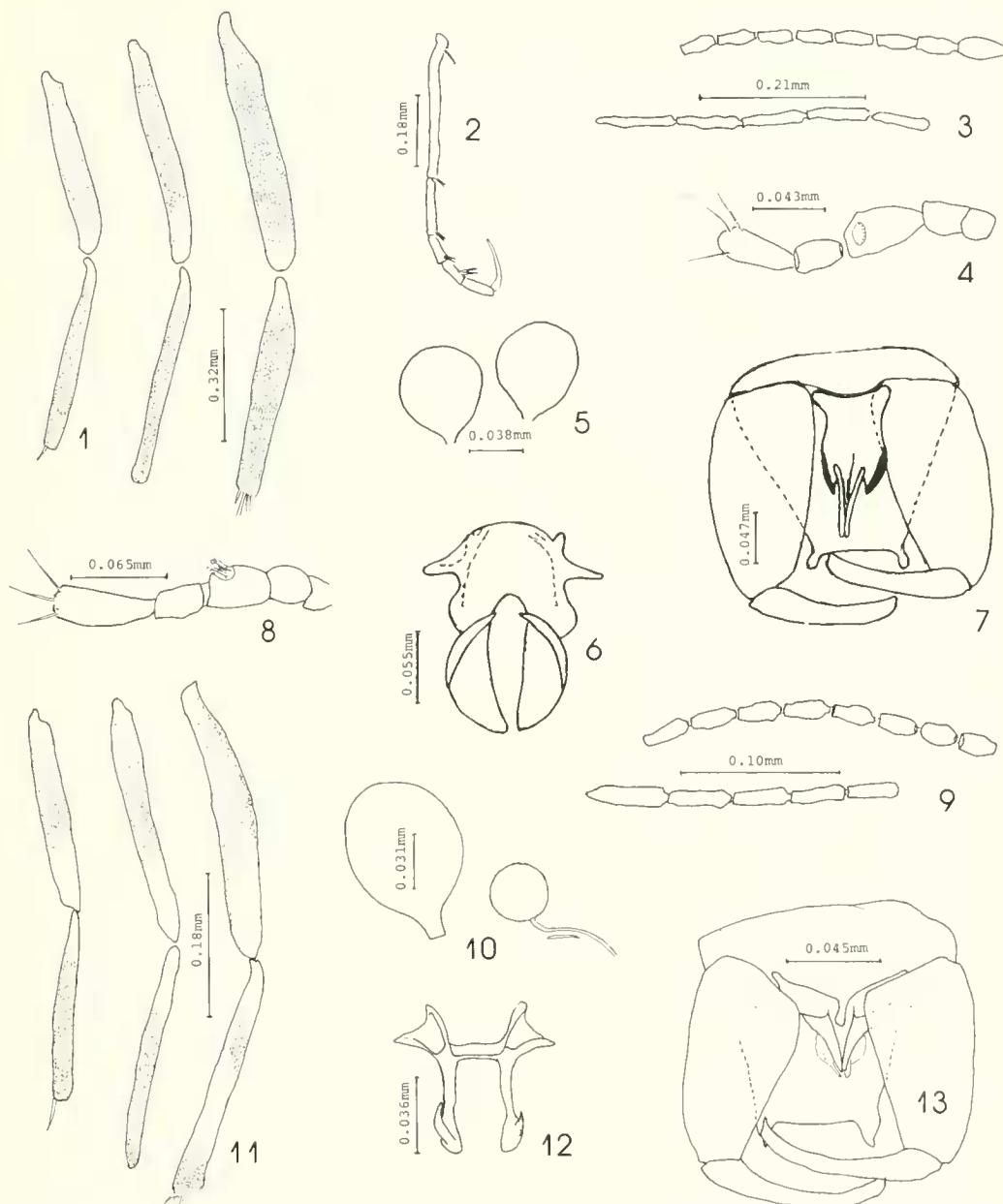
Male holotype.—Wing length 0.98 mm; breadth 0.29 mm.

Similar to the female with the usual sexual differences. Wing much narrower, costa shorter, CR 0.72. Antenna with well-developed, pale brownish plume; lengths of flagellar segments in proportion of 28-10-10-10-10-10-8-8-12-27-25-26, antennal ratio 0.87. Hind leg with lengths from femur to tarsomere 5 as 77-64-40-20-12-8-10. Claws short, equal and similar on all legs, each bent at base and straight distally.

**Genitalia** (Fig. 7): Dark brown, strongly sclerotized, about as long as broad. Ninth sternum narrow, slightly broadened caudad in midportion, there with four strong setae; ninth tergum convex distally, caudal margin nearly straight, with a pair of small, bead-like, apicolateral processes, each with a minute seta. Basistyle stout, about twice as long as broad, without lobes or armament; dististyle 0.65 as long as basistyle, moderately stout distally, slightly curved. Aedeagus complex, typical of the genus; basally a broad median plate about half again as long as broad, with a pair of short, stout, anterolateral arms, distolateral corners of the plate strongly sclerotized, flangelike; on the concave caudal margin of this plate between the flanges arise a pair of long slender processes nearly as long as the plate, with tips converging caudally on midline. Parameres (Fig. 6) joined on proximal third in a sclerotized plate with irregular outlines as figured, posteriorly expanded in a pair of broad, crescent-shaped processes, each bearing at broadest point on lateral margin a curved blade directed ventromesally with apices nearly meeting on midline at about half the length of the plate.

Distribution.—Fiji.

Types.—Holotype male, allotype female,



Figs. 1-13. Figs. 1-7, *Downeshelea stenochora*, 1-5, female; 6-7, male; Figs. 8-13, *Monohelea beaveri*, 8-11, female; 12-13, male; 1, 11, femora and tibiae of (left to right) fore, mid and hind legs; 2, hind tarsus; 3, 9, antenna; 4, 8, palp; 5, 10, spermathecae; 6, 12, parameres; 7, 13, genitalia, parameres omitted.

Viti Levu, Savura Creek, Colo-i-Suva, Fiji, iv. 1983, R. A. Beaver, in Malaise trap. Paratype, 1 male, same data except v. 1983.

**Etymology.**—The specific name is from

the Greek: *stenos*—narrow, and *chora*—space, referring to the unusually narrow radial cells of this species.

**Discussion.**—Six species of *Downeshelea*

are known from the Australasian Region (Wirth and Grogan 1988): *leei* (Debenham 1972) from New South Wales, *medanieli* (Tokunaga, in Tokunaga and Murachi 1959) from the Caroline Islands, *nigra* (Tokunaga 1963) from New Guinea, *sepikensis* (Debenham 1972) from New Guinea, *unimaculata* (Debenham 1972) from New South Wales, and *xanthogonua* (Tokunaga 1963) from New Guinea. Of these species, *D. stenochora* most closely resembles *xanthogonua*, with the same general structure of the male genitalia, especially the setae on the ninth sternum, shape of the apicolateal processes on the ninth tergum, and the general plan of the aedeagus and parameres. However, *D. xanthogonua* is readily distinguished from *stenochora* by its more restricted wing pattern, the shorter and broader radial cells, and the different shapes of the aedeagus and the distal portions of the parameres.

#### Genus *Echinohelea* Macfie

*Reference:* Debenham, 1970: 145 (revision, species of Australia and New Guinea; key).

#### *Echinohelea flava* Tokunaga

*Echinohelea flava* Tokunaga, 1963: 235 (female; New Britain; figs.); Debenham, 1970: 151 (descriptive notes; male described and figured is not *flava*; New Guinea, Solomon Is.).

*Recorded Distribution.*—New Britain, New Guinea, Solomon Islands.

*New Records.*—FIJI: Viti Levu, Lami, ii.1981 (Krauss), 6 males, 7 females (BISH); Naussori Highlands, 500–700 m, xi.1976 (Krauss), 1 male, 1 female; Navai, 10.ii.1971 (Krauss), 1 male; Colo-i-Suva, Savura Creek, v.1983 (Beaver), 1 male.

#### Genus *Monohelea* Kieffer

*References:* Tokunaga and Murachi, 1959 (Micronesian species); Tokunaga, 1959, 1963 (New Guinea species); Debenham, 1972 (revision Australia and New Guinea

species); Ratanaworabhan and Wirth, 1972 (revision Oriental species); Clastrier, 1985a (New Caledonia species); Wirth and Grogan, 1988 (diagnosis of genus and check list of species for world).

*Remarks.*—Wirth and Grogan (1988) divided the traditionally recognized genus *Monohelea* into three genera, *Monohelea* Kieffer, *Allohelea* Kieffer, and *Downeshelea* Wirth and Grogan, for which they gave diagnoses and world lists of species. They restricted the genus *Monohelea* to two groups, the *tigrina* group, an Australasian group of clear-winged species, and the *hieroglyphica* group, a large and widespread group with a hieroglyphic type wing pattern and extensively banded legs. They listed 10 species of the *hieroglyphica* group from the Australasian Region; species of this group are difficult to separate except for details of the male genitalia. Adults of both sexes of the species occurring in Fiji, however, can be separated by the following key:

#### KEY TO THE FIJIAN SPECIES OF *MONOHELEA*

- |   |                               |
|---|-------------------------------|
| 1. Hind femur pale except for subapical dark band   | 2                             |
| — Hind femur dark at least on proximal half   | 3                             |
| 2. Mid femur and tibia pale except apex of tibia  |                               |
| .....   | <i>coloisuvae</i> new species |
| — Mid femur and tibia brownish  |                               |
| .....   | <i>fijiensis</i> new species  |
| 3. Second radial cell of wing without infuscated area; costa short, costal ratio 0.79; hind femur brown on proximal 0.75, pale on distal 0.25; fore and mid femora and tibiae pale brown except broadly pale at knees   | <i>beaveri</i> new species    |
| — Second radial cell with large infuscated area; costa long, costal ratio 0.89; hind femur brown except for two distal oblique narrow pale rings; fore and mid femora pale with subapical dark band, tibiae pale with subbasal dark band and apical dark band | <i>leveri</i> new species     |

#### *Monohelea beaveri* Wirth and Giles, NEW SPECIES

Figs. 8–13, 52

*Female allotype.*—Wing length 0.76 mm; breadth 0.30 mm.

*Head:* Yellowish, antennae pale brown, palpi whitish. Eyes broadly separated, bare.

Antenna (Fig. 9) with lengths of flagellar segments in proportion of 11-9-10-10-10-11-11-12-13-13-14-15-20; antennal ratio 0.90. Palpus (Fig. 8) with lengths of segments in proportion of 3-4-6-5-11; third segment with small round sensory pit. Mandible with eight small teeth.

**Thorax:** Pale brown; mesonotum with dark brown mottling seen in slide-mounted specimen; scutellum yellow. Legs (Fig. 11) pale yellowish with pale brownish bands as follows: proximal 0.6 of femora, all except bases of fore and mid tibiae, and a moderately broad subbasal band and distal fifth of hind tibia; bands on hind legs more intense. Hind leg with lengths from femur to tarsomere 5 as 114-103-50-24-16-18-13; hind basitarsus with abrupt bend near base and with row of palisade setae; tarsi without prominent ventral spines. Claws nearly straight, subequal on fore and mid legs, a single long claw on hind leg; lengths 0.043 mm on fore leg, 0.040 mm on mid leg, and 0.058 mm on hind leg. Wing (Fig. 52) with pattern typical of *hieroglyphica* species group; no dark spot in midportion of second radial cell; costal ratio 0.79; radial cells well formed, first 0.55 as long as second. Halter whitish with end of knob brown.

**Abdomen:** Pale brown. Spermathecae (Fig. 10) two; greatly unequal in size and shape, the larger 0.062 mm by 0.046 mm including neck, ovoid with short thick neck; the smaller subspherical, 0.026 mm by 0.023 mm, without neck but with long, threadlike sclerotization of the duct.

**Male holotype.**—Wing length 0.70 mm; breadth 0.30 mm.

Similar to the female with the usual sexual differences. Wing slightly narrower; costa shorter, costal ratio 0.70. Antenna with sparse brownish plume; segments 6-12 fused; antennal ratio 0.67. Legs with markings as in female; hind leg with lengths from femur to tarsomere 5 as 95-86-48-34-16-10-12; claws short, equal and similar on all legs, very slender and pointed and nearly straight.

**Genitalia** (Fig. 13): Dark brown; short, about as broad as long. Basistyle stout and tapering; dististyle nearly as long as basistyle, slender and curving gradually to tip. Aedeagus typical of *hieroglyphica* group, the well-sclerotized, triangular, lateral sclerites joined basally by a sclerotized loop, the median dorsal membrane with bilobed caudal margin, the lobes sharp-pointed. Parameres (Fig. 12) with the winglike anterior lobes joined mesally by a narrow sclerotized bridge, the caudal portions well separated, each a slender, nearly straight column slightly expanded distally, especially in lateral view, and abruptly recurved on distal portion in a slender pointed process bent ventrally.

#### Distribution.—Fiji.

**Types.**—Holotype male, allotype female, Viti Levu, Colo-i-Suva, Savura Creek, v. 1983, R. A. Beaver, Malaise trap. Paratypes, 9 males, 9 females, as follows: VITI LEVU: Same data as types, 4 males, 6 females; same but iv. 1983, 4 males, 3 females. Naraiyama, 178°5'E, 17°56'S, 18-30.xi.1986, R. L. Brown, UV light trap, 1 male.

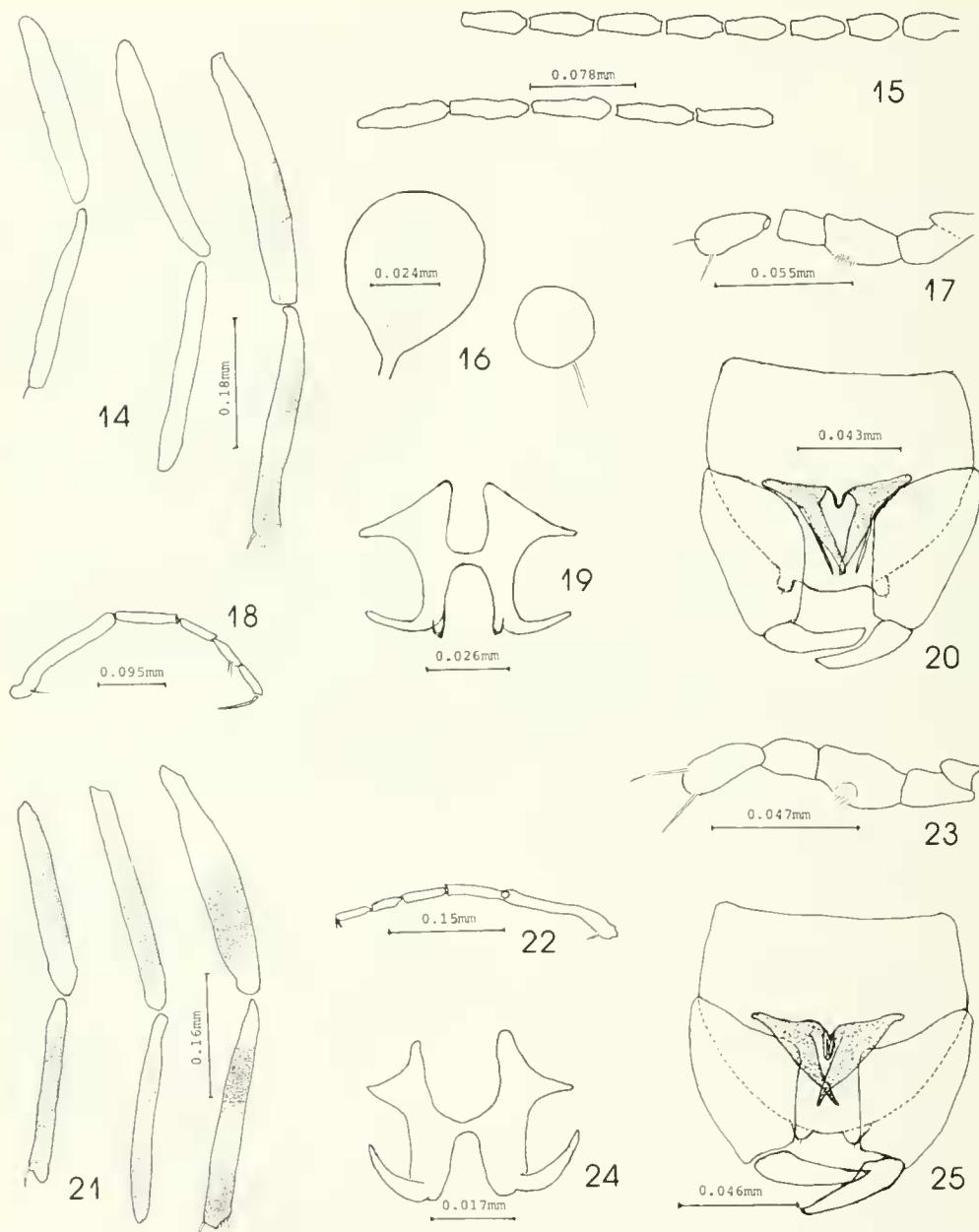
**Discussion.**—This species is dedicated with pleasure to R. A. Beaver of the Biology Department, University of the South Pacific in Suva, in appreciation of his kindness and assistance to the senior author during his visit to Fiji in 1985.

*Monohela beaveri* can be distinguished from the three other Fijian species of *Monohela* by the characters presented in the key above.

#### *Monohela coloisuvae* Wirth and Giles, NEW SPECIES Figs. 14-20, 53

**Female allotype.**—Wing length 0.78 mm; breadth 0.33 mm.

**Head:** Yellowish, antenna pale brown, palpi whitish. Eyes broadly separated, bare. Antenna (Fig. 15) with lengths of flagellar segments in proportion of 12-10-12-13-14-14-15-16-17-17-20; antennal ratio



Figs. 14–25. Figs. 14–20, *Monohelea coloisuvae*, 14–18, female; 19–20, male; Figs. 21–25, *M. fijiensis*, male; 14, 21, femora and tibiae of (left to right) fore, mid and hind legs; 15, antenna; 16, spermathecae; 17, 23, palpus; 18, 22, hind tarsus; 19, 24, parameres; 20, 25, genitalia, parameres omitted.

0.83. Palpus (Fig. 17) with lengths of segments in proportion of 4-5-8-6-8; third segment with inconspicuous small round sensory pit. Mandible with eight small teeth.

*Thorax:* Yellowish with brownish mottling; scutellum yellow. Legs (Fig. 14) pale yellowish, coxae brownish. Hind leg with three brown bands; femur with an oblique

band just past midlength continued as a narrow infuscation ventrally to tip of femur; tibia with narrow brown band just before midlength and a broad brown area covering distal fourth. Hind leg with lengths from femur to tarsomere 5 as 115-100-50-25-16-13-13. Claws long and slender, slightly curving, subequal on fore and mid legs, a single long claw on hind leg (Fig. 18); lengths 0.044 mm on fore leg, 0.039 mm on mid leg, and 0.064 mm on hind leg. Very slender ventral spines on tarsi as follows: One subbasally on mid and hind basitarsi; a pair at apices of fourth tarsomeres, and a pair at apices of tarsomeres 1-3 on mid leg. Wing (Fig. 53) with hieroglyphic pattern as in *M. beaveri*; CR 0.79. Halter whitish with end of knob brown.

**Abdomen:** Pale brownish. Spermathecae (Fig. 16) two, greatly unequal in size and shape; the larger 0.067 by 0.049 mm including neck, ovoid, tapering to slender neck, with faint perforations in sclerotization on tapering portion near neck; the smaller 0.029 mm in diameter, spherical, without neck but with long, threadlike sclerotization of the duct.

**Male holotype.**—Wing length 0.72 mm; breadth 0.30 mm.

Similar to the female with the usual sexual differences; costal ratio 0.74. Antenna with sparse brownish plume; segments 6-12 fused; distal three segments elongated, antennal ratio 0.90. Legs with markings as in female, femora slightly infuscated on fore and mid legs, ventral infuscation at tip of hind femur fainter; hind leg with lengths from femur to tarsomere 5 as 97-90-47-24-14-11-12; claws short, equal and similar on all legs, very slender and pointed, and nearly straight.

**Genitalia** (Fig. 20): Brown, about as broad as long. Ninth tergum convex distally with small, moderately separated, papilla-like apicolateral processes. Dististyle short, half as long as basistyle, moderately stout and tapering to blunt-pointed tip. Aedeagus with lateral sclerites rather slender distally, each

flanked by a slender hyaline blade subequal in length. Parameres (Fig. 19) joined in a narrow bridge near midportions, bases expanded winglike as usual in *hieroglyphica* group; distal portions each moderately slender and gradually tapering to ventrolaterally directed distal process, a small rounded ventromesal lobe at the base of the bent distal process.

#### Distribution.—Fiji.

**Types.**—Holotype male, Viti Levu, Nariyama, 28-30.xi.1986, R. L. Brown, UV light trap. Allotype female, Viti Levu, Colo-i-Suva, Savura Creek, v.1983, R. A. Beaver, Malaise trap. Paratypes, 2 females, same data as allotype; 2 males, 3 females, same data but iv.1983.

**Discussion.**—The species takes its name from the locality near Suva on Viti Levu where the allotype and paratypes were collected. *Monohelea coloisuvae* can be distinguished from the three other Fijian species of *Monohelea* by the characters presented in the key above. It is the Fijian species with the most restricted brownish leg markings, and the shapes of the distal portions of the parameres are diagnostic.

#### *Monohelea fijiensis* Wirth and Giles,

##### NEW SPECIES

Figs. 21-25, 54

**Male holotype.**—Closely resembling the preceding species, *Monohelea beaveri*, but differing as follows: Wing length 0.69 mm; breadth 0.27.

**Head:** Antenna with lengths of flagellar segments in proportion of 20-7-7-7-7-6-5-5-6-20-20-23, antennal ratio 0.82. Palpus (Fig. 23) with lengths of segments in proportion of 6-9-17-10-16, third segment with small round sensory pit.

**Thorax:** More extensively brownish, but scutellum almost entirely yellowish. Legs (Fig. 21) pale brownish, knees narrowly pale; hind femur and tibia pale with three broad dark bands, one subapically on femur, second sub-basally on tibia, and third at apex of tibia. Hing leg with lengths from femur

to tarsomere 5 as 92-80-453-23-15-12-12. Claws small, equal and simple on all legs (Fig. 22). Wing (Fig. 54) with dark markings as in *beaveri*, but not quite as extensive; costal ratio 0.67.

*Genitalia* (Fig. 25): Shorter and broader than in *beaveri*; ninth tergum more convex distally, apicolateral processes smaller and rounded and set closer together near midline. Dististyle short and tapering, only two-thirds as long as basistyle. Aedeagus with lateral sclerites stouter, the basal loop not well developed. Parameres (Fig. 24) short and stout, joined in midportion at about half their length; each distal portion a broad, distally rounded plate, from the apex of which arises a moderately slender, tapering process of about the same length, curving ventrolaterad.

*Distribution*.—Fiji.

*Types*.—Holotype male, one male paratype, Viti Levu, Colo-i-Suva, Savura Creek, iv.1983, R. A. Beaver, Malaise trap. One male paratype, Naraiyama, Viti Levu, 28-30.xi.1986, R. L. Brown, UV light trap.

*Discussion*.—*Monohelea fijiensis* can be separated from its three Fijian congeners by the characters given in the key above.

#### *Monohelea leveri* Wirth and Giles,

NEW SPECIES

Figs. 33-39, 55

*Female allotype*.—Wing length 0.70 mm; breadth 0.36 mm.

*Head*: Pale brown, antennae darker, palpi paler. Eyes broadly separated, bare. Antenna (Fig. 36) with lengths of flagellar segments in proportion of 10-7-7-8-8-9-10-10-12-12-13-15-20; antennal ratio 1.04. Palpus (Fig. 35) short and stubby; lengths of segments in proportion of 3-4-6-5-8; sensory pit on third segment small and round. Mandible with eight strong teeth.

*Thorax*: Brown including scutellum. Legs (Fig. 33) brown; distal third of fore femur and proximal third of fore tibia pale, also a broad but incomplete subapical pale band on fore tibia; mid femur pale on mid third,

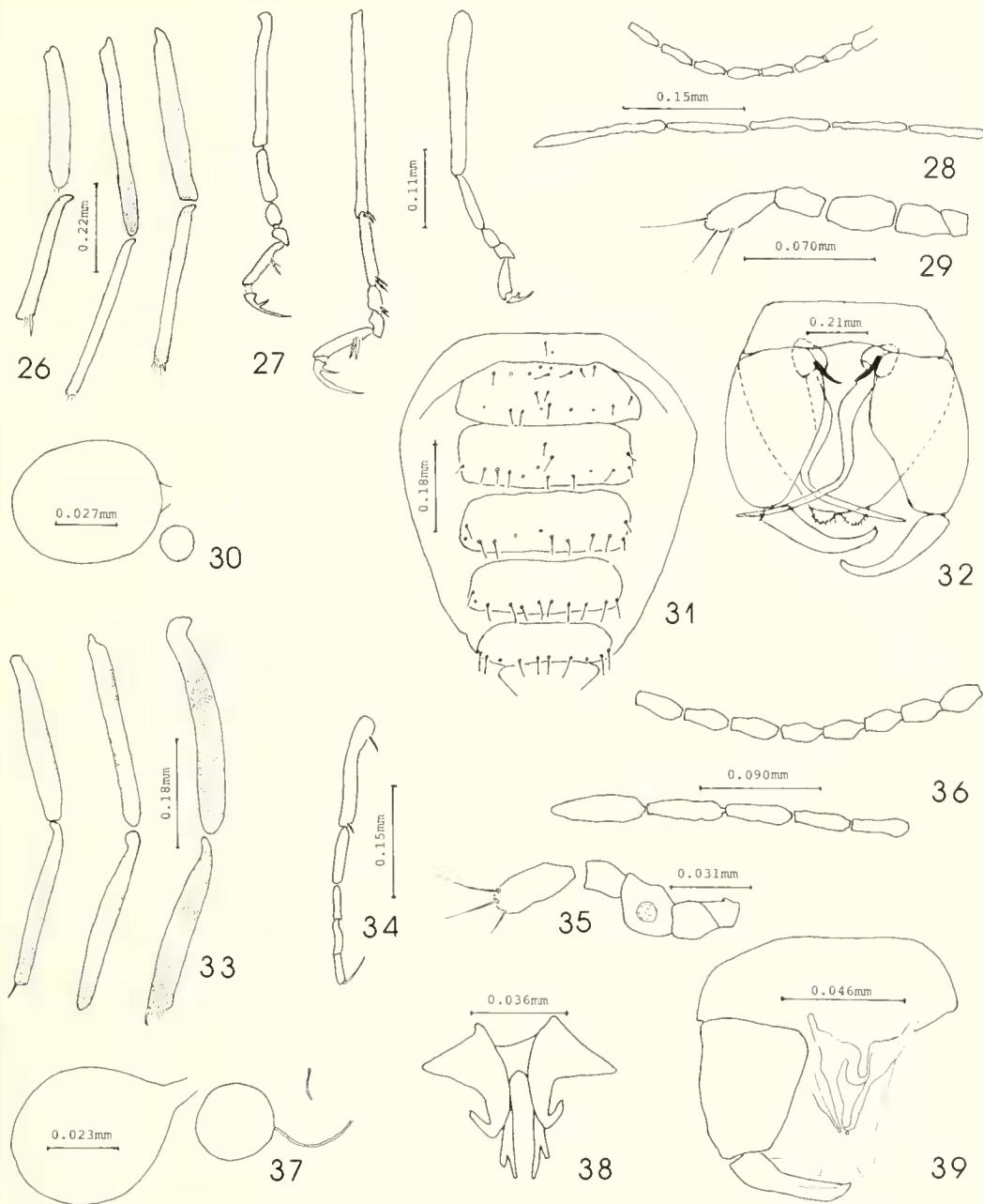
mid tibia pale on mid half; hind femur and tibia dark brown except narrow pale bands in midportion. Hind leg with lengths from femur to tarsomere 5 as 96-82-43-20-13-12-12; hind femur and tibia slightly thickened and hind femur slightly bowed. Mid and hind basitarsi with a strong spine near base and a pair of slender spines at apex (Fig. 34); a pair of slender spines at apices of tarsomeres 2-4 on mid leg. Claws nearly straight, subequal on fore and mid legs, a single long claw on hind leg; lengths 0.029 mm on fore leg, 0.026 mm on mid leg, and 0.046 mm on hind leg. Wing (Fig. 55) with dark hieroglyphic pattern much more extensive than in other Fijian species, a prominent dark mark included in midportion of second radial cell; costa unusually long, costal ratio 0.89. Halter brown.

*Abdomen*: Pale brown. Spermathecae (Fig. 37) two, greatly unequal in size and shape, the larger 0.069 by 0.046 mm including neck, ovoid with short thick neck; the smaller spherical, 0.029 mm in diameter, without neck but with long, threadlike sclerotization of the duct.

*Male holotype*.—Wing length 0.67 mm; breadth 0.27 mm.

Similar to the female with the usual sexual differences; wing narrower and costa shorter as normal in the genus; costal ratio 0.80. Antenna with sparse, pale brownish plume, segments 6-12 fused as usual; antennal ratio 0.77. Legs with markings as in female; hind leg with lengths from femur to tarsomere 5 as 94-80-42-22-15-12-13; claws short, equal and similar on all legs, very slender and pointed and nearly straight.

*Genitalia* (Fig. 39): Slightly broader than long, brownish. Ninth tergum convex distad, with short, papilla-like apicolateral processes. Dististyle stout and tapering to blunt point, about two-thirds as long as basistyle. Aedeagus with darkly sclerotized basal loop, the lateral sclerites slender distally, flanked laterally by a slender process similar to that of *M. coloisuvae*. Parameres (Fig. 38) short and broad, the lateral wings at base well



Figs. 26-39. Figs. 26-32, *Stilobezzia browni*, 26-31, female; 32, male; Figs. 33-39, *Monohelea leveri*, 33-37, female; 38-39, male; 26, 33, femora and tibiae of (left to right) fore, mid and hind legs; 28, 36, antenna; 29, 35, palpus; 30, 37, spermathecae; 31, abdominal terga; 32, genitalia; 38, parameres; 39, genitalia, parameres omitted.

developed; main stem portion of each unusually short, tapering and abruptly bending ventrolaterally in a hooklike process; the stem portion continuing straight caudally in a prominent, rather slender, unequally forked, distal process twice as long as the hooklike ventrolateral process.

**Distribution.**—Fiji.

**Types.**—Holotype male, allotype female, Viti Levu, Colo-i-Suva, Savura Creek, iv.1983, R. A. Beaver, Malaise trap.

**Discussion.**—The species is dedicated to the memory of R. J. A. W. Lever, for many years the Government Entomologist for the British Colony of Fiji, and the foremost authority on the economic insects of the southwestern Pacific islands. The insect collection at the Agriculture Station at Koronivia remains a well-curated collection of specimens, the great majority of which were collected by Lever.

*Monohelea leveri* differs markedly from the three other known species of Fijian *Monohelea*, distinguished by its stout legs, more brownish color with more extensively dark wing markings, more extensive brownish leg markings, and especially by the unusually long costa and second radial cell. The male parameres, with their short, curved, lateral process and long, straight, unequally-forked, distal process, are diagnostic. *Monohelea palauensis* Tokunaga (in Tokunaga and Murachi 1959), a widespread Pacific species, is closely related, with stout legs, wing pattern with a dark mark in the second radial cell, and male genitalia of a similar structure, but *palauensis* differs in its shorter costa (female costal ratio 0.79), paler legs, and different proportions on the distal processes of the male parameres.

#### Genus *Stilobezzia* Kieffer

**References:** Lee, 1948: 345 (key to Australia and New Zealand species); Tokunaga and Murachi, 1959: 363 (Micronesian species); Tokunaga, 1963: 249 (key to New Guinea species); Das Gupta and Wirth,

1968: 1 (revision of Oriental species; generic diagnosis).

#### *Stilobezzia bifurcata* Tokunaga

*Stilobezzia bifurcata* Tokunaga, 1959: 307 (male, female; New Guinea; figs.); Tokunaga, 1963: 271 (notes; New Guinea records); Debenham, 1978: 472 (Australasian literature and distribution).

**Recorded distribution.**—Irian Jaya, New Britain, New Guinea.

**New records.**—FIJI: Viti Levu, Ovalau, Levuka, xi.1975, N. L. H. Krauss, 1 female (BISH); Korotongo, iii.1981 (Krauss), 1 male (BISH); Lami, ii.1981 (Krauss), 1 male; same, i.iii.1971, iii.1976, ii.1977, xii.1978 (Krauss), 1 male, 7 females; 14 km w Lami, 7-10.xii.1986, R. L. & B. B. Brown, UV light trap, 2 males, 4 females.

#### *Stilobezzia (Stilobezzia) browni*

Wirth and Giles, NEW SPECIES

Figs. 26-32, 56

**Allotype female.**—Wing length 1.05 mm; breadth 0.36 mm.

**Head:** Yellowish brown; palpi and antennal flagellum, except bases of first eight segments, dusky. Eyes contiguous, bare. Antenna (Fig. 28) with lengths of flagellar segments in proportion of 16-13-13-13-13-14-14-14-30-30-30-40; antennal ratio 1.46. Palpus (Fig. 29) with lengths of segments in proportion of 5-7-12-10-12. Mandible with seven coarse teeth.

**Thorax:** Pale brownish. Legs (Fig. 26) yellowish, hind leg with lengths from femur to tarsomere 5 as 120-110-60-22-7-6-16; without strong setae except a few at tips of femora. Hind basitarsus with 2½ rows of palisade setae; one row on first two tarsomeres of fore and mid legs and tarsomere 2 of hind leg; fourth tarsomere of fore and mid legs with pair of strong black batonnets. A single long claw on each leg, claw with slender basal tooth nearly half as long as claw; length of claw 0.058 mm on fore leg, 0.080 mm on mid leg and 0.038 mm on

hind leg (Fig. 27). Wing (Fig. 56) pale grayish hyaline, without macrotricinia, veins slightly infuscated; first radial cell small, slightly elongate; second radial cell spacious; costal ratio 0.68. Halter brownish.

*Abdomen*: Yellowish; terga brownish, with setae arranged in pattern as figured (Fig. 31). Spermathecae (Fig. 30) two, greatly unequal in size and shape; the larger brownish, 0.072 by 0.058 mm, oval without sclerotized neck; the smaller hyaline, spherical, 0.017 mm in diameter.

Holotype male.—Wing length 1.05 mm; breadth 0.33 mm.

Similar to the female with the usual sexual differences. Eyes broadly separated, bare. Antenna with well-developed plume which is yellowish proximally, dusky distally; lengths of flagellar segments in proportion of 25-14-14-14-14-14-14-14-16-43-50-72; antennal ratio 1.08. Palpus as in female. Thorax darker brown than in female, scutellum paler. Legs yellowish, distal third of mid femur slightly darkened; tarsomeres 1-3 of mid leg with pair of distal spines ventrally; fifth tarsomeres without batonnets; claws short, equal, distally cleft on all legs. Wing as in female but narrower; costal ratio 0.66. Halter with dark brown knob.

*Genitalia* (Fig. 32): Pale brownish, broader than long; ninth tergum convex caudally with a submedian pair of prominent setose cerci. Basistyle short, stout, tapering distally; dististyle half as long as basistyle, curved, gradually tapered to slender pointed tip. Aedeagus reduced to a pair of small linear sclerites extending obliquely caudomesad from base of basistyle. Parameres separate, each with prominent basal knob, main portion in form of a very elongate, strongly sclerotized, sickle-like blade slightly swollen on proximal third, straighter on distal half.

Distribution.—Fiji.

Types.—Holotype male, allotype female, Viti Levu, 14 km w Lami, 7-10.xii.1986, R. L. and B. B. Brown, UV light trap. Paratypes, 1 male, 1 female, same data; 1 male,

Suva, Koronivia Agr. Sta., 6.xii.1968, S. Singh, light trap (BISH).

Discussion.—This species is named for Richard L. Brown in appreciation of his interest and cooperation in making available to us his fine collection of ceratopogonids taken during his visit to Fiji in 1986.

*Stilobezzia browni* belongs to the *subviridis* group of the subgenus *Stilobezzia* as characterized by Das Gupta and Wirth (1968), but is not closely related to any of the Oriental species described in that group. It is most similar, especially in the shape of the male parameres, to *S. flavizonata* Tokunaga (1963), described from New Guinea, but that species (male only) is paler yellow, the abdomen dark with two basal terga pale yellow, and the aedeagus shaped differently.

#### Tribe Heteromyiini Genus *Clinohelea* Kieffer

Reference: Debenham, 1974: 6 (revision, species of Australia and New Guinea; key).

#### *Clinohelea tasmaniensis* Lee

*Clinohelea tasmaniensis* Lee, 1948: 65 (male, female; Tasmania; figs.); Debenham, 1974: 7 (redescribed; Australia records).

Recorded distribution.—Australia (Tasmania to southern Queensland).

New records.—FIJI: Viti Levu, Lami, iii.1955, iii.1976, N. L. H. Krauss, 2 females; Nagali, xi.1957 (Krauss) (BISH), 1 female; Suva, Koronivia, 6.xii.1968 (Singh), light trap, 1 female (BISH).

Note.—The two Fiji females agree well with an Australian female in the USNM, except that the fore femur is dark brown only at the extreme tip in Fiji specimens.

#### Tribe Sphaeromiini Genus *Hebetula* Wirth and Debenham

Reference: Debenham, 1974: 22 (revision Australia and New Guinea spp.; as *Mixohelea*); Wirth and Debenham, 1977: 282 (diagnosis; list of included species).

*Hebetula tonnoiri* (Lee)

*Xenohelea tonnoiri* Lee, 1948: 66 (female; Tasmania; figs.); Tokunaga, 1966: 116 (female redescribed; New Guinea).

*Mixohelea tonnoiri* (Lee); Debenham, 1974: 22 (combination; male, pupa described; Australia records; figs.).

*Hebetula tonnoiri* (Lee); Wirth and Debenham, 1977: 282 (combination).

Recorded distribution.—Australia, New Guinea.

New records.—FIJI: Ovalua, Levuka, iii.1969 (Krauss), 1 female (BISH). Viti Levu, Lami, i.iii.1971, iii.1976, ii.1977, xii.1978 (Krauss), 12 females (BISH). 2 km N Naraiyawa, 27.x.1986, R. L. Brown, at light, 1 male, 1 female (USNM); Nausori Highlands, 500--700 m, 26.iii.1970 (Krauss), 1 female (BISH); Suva, Koronivia Agr. Sta., 6.xii.1968 (Singh), light trap, 1 female (BISH); Suva, xi.1957 (Krauss), 2 females (BISH); Tholo-i-Suva, i.1955 (Krauss), 1 female (USNM).

Genus *Nilobezzia* Kieffer

Reference: Debenham, 1974: 62 (revision species Australia and New Guinea); Wirth and Ratanaworabhan, 1981: 408 (key to Oriental species).

*Nilobezzia fijiensis*

Wirth and Giles, NEW SPECIES  
Figs. 40-44, 57

Holotype female.—Wing length 2.48 mm, breadth 0.74 mm.

**Head:** Dark brown including antenna and palpus. Eyes broadly contiguous. Antenna (Fig. 40) with lengths of flagellar segments in proportion of 25-13-13-13-13-13-14-16-42-42-40-40-50, antennal ratio 1.65. Palpus (Fig. 41) with lengths of segments in proportion of 10-15-20-8-12; second segment broadest, succeeding segments progressively more slender. Mandibles with five and seven teeth.

**Thorax:** Dark brown including scutellum (pinned paratype was mounted from fluid

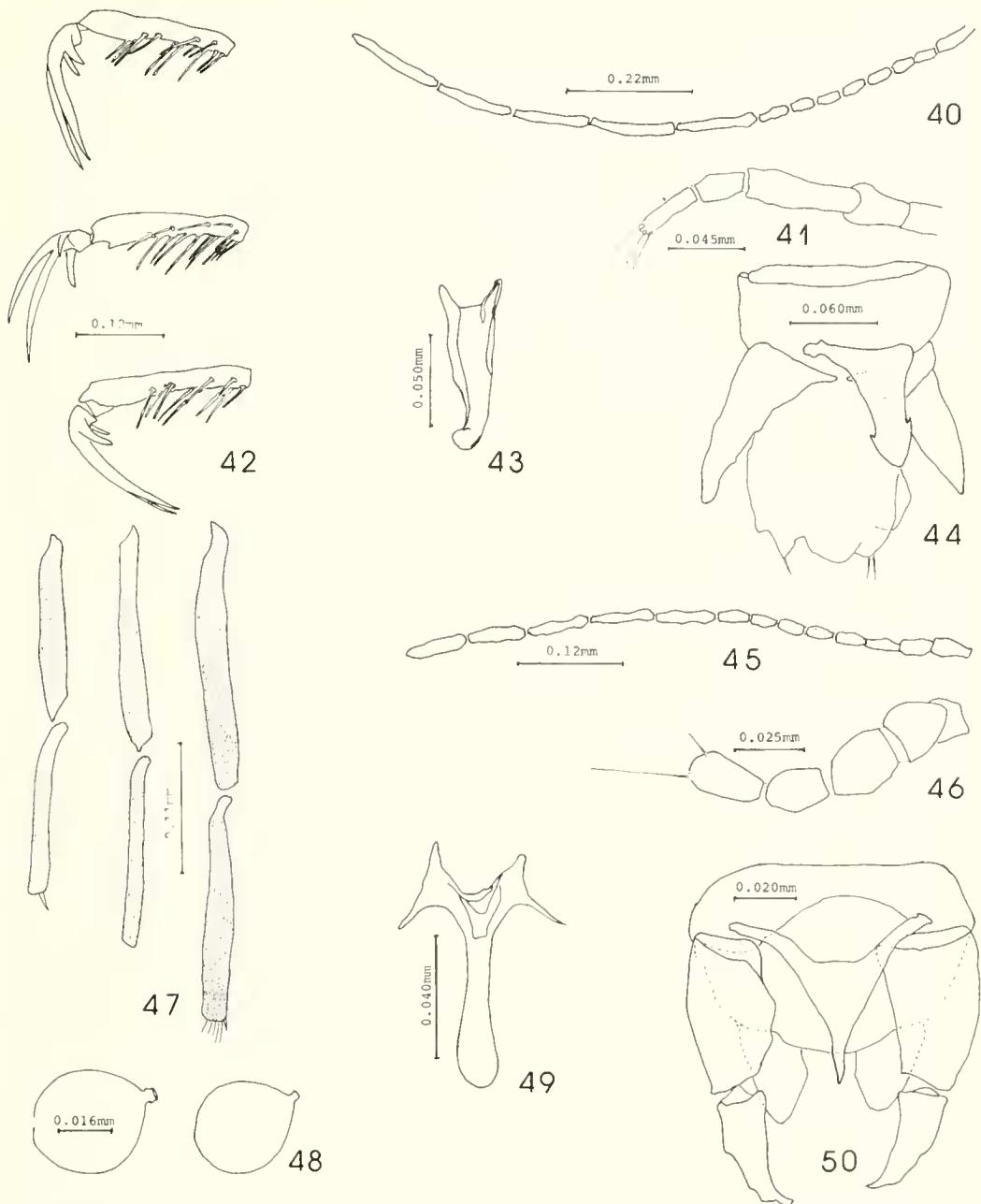
and thorax is dirty, pollinosity obscured if present). Legs dark brown; tarsi yellowish but narrow apices of tarsomeres 1, 3, most of 4, and all of tarsomere 5 brownish. Femora each with one strong black ventral spine at apex; tibiae with 5-6 enlarged bristles scattered along dorsal side; tarsomere 5 (Fig. 42) with 12 black batonnets on fore leg, 14 on mid leg, and 10 on hind leg; claws 0.9 as long as fifth tarsomeres, external tooth 0.27 as long as claws. Wing (Fig. 57) pale smoky grayish, anterior veins yellowish; costal ratio 0.84. Halter brown.

**Abdomen:** Dark brown. Gonopore flanked by several short bristles and 4-5 long black bristles on each side. Spermathecae obscured on slide mount; shapes and measurements not discernible.

Allotype male.—Taken at a different time and place, the specimen described here is the presumed male of *N. fijiensis*, in spite of minor differences in setation and the paler color presumed to be due to prolonged storage in alcohol.

Wing length 1.47 mm; breadth 0.45 mm; costal ratio 0.72. Thorax dark brown, head and legs paler brownish; wing grayish, radial veins slightly infuscated; halter brownish. Eyes contiguous. Antenna with sparse pale brownish plume; lengths of flagellar segments in proportion of 28-16-15-15-15-16-16-16-17-24-28-28-x; last segment not in position to measure. Palpus stubby; lengths of segments in proportion of 3-7-12-5-8. Legs without strong spines at apices of femora.

**Genitalia** (Fig. 44): Dark brown; shape and structure typical of the genus, with short ninth sternum and elongate ninth tergum with irregularly convex posterior margin. Basistyle and dististyle inperceptibly fused in a long, irregularly tapering lobe three-fourths as long as tergum. Aedeagus a triangular sclerite half again as long as basal breadth, with very slight anterior concavity, tapering distally to a slightly expanded cap-like tip. Parameres (Fig. 43) fused in another triangular tapering sclerite, slightly longer



Figs. 40–50. Figs. 40–44, *Nilobezzia fijiensis*, 40–42, female; 43–44, male; Figs. 45–50, *Bezzia vitilevuensis*, 45–48, female; 49, 50, male; 40, 45, antenna; 41, 46, palpus; 42, fifth tarsomere and claws of (top to bottom) fore, mid and hind legs; 43, 49, parameres; 44, 50, genitalia, parameres omitted; 47, femora and tibiae of (left to right), fore, mid and hind legs; 48, spermathecae.

and basally narrower than aedeagus, with slender knoblike tip bent posteroventrally.

**Distribution.**—Fiji.

**Types.**—Holotype female, Viti Levu, Lami, ii.1981, N. L. H. Krauss (USNM). Allotype male, Viti Levu, Suva, Koronivia Agr. Sta. 6.xii.1968, S. Singh, light trap (BISH). Paratype, 1 female, Viti Levu, Suva, iii.1956 (Krauss) (BISH).

**Discussion.**—*Nilobezzia fijiensis* closely resembles the widespread Oriental species *N. raphaelis* (Salm) in its uniformly dark brown femora and tibiae, dark brown antenna and abdomen, and femora with only 1–2 apical spines, but *raphaelis* differs in having pale palpi and whitish halteres. *Nilobezzia whartoni* Lee from Australia and New Guinea is similar but possesses pale halteres and a whitish abdomen.

#### Tribe Palpomyiini Genus *Bezzia* Kieffer

**References:** Tokunaga, 1966: 141 (New Guinea species; key); Debenham, 1978: 557 (catalog, Australasian Region); Wirth and Ratanaworabhan, 1981: 413 (Southeast Asia species; key); Clastrier, 1985b: 45 (new species from New Caledonia).

#### *Bezzia vitilevuensis* Wirth and Giles, NEW SPECIES Figs. 45–50, 58

**Holotype female.**—Wing length 1.02 mm; breadth 0.43 mm.

**Head:** Dark brown. Eyes broadly contiguous, bare. Vertex with strong spines curving over eyes. Antenna (Fig. 45) with lengths of flagellar segments in proportion of 15–12–12–11–10–10–10–20–20–20–20–21; antennal ratio 1.12. Palpus (Fig. 46) short and stubby; lengths of segments in proportion of 3–5–7–6–7. Mandible with nine coarse teeth.

**Thorax:** Dark brown; mesonotum with scattered erect spinelike setae; supra-alar setae especially long and spinelike. Legs (Fig. 47) dark brown, tarsi whitish; femora unarmed; tarsomeres 1 and 2 of mid leg with

one row of palisade setae, 1 and 2 of hind leg with two rows of palisade setae. Hind leg with lengths from femur to tarsomere 5 as 124–106–70–26–13–10–15; claws short, curved, equal, each claw 0.032 mm long. Wing (Fig. 58) slightly brownish infuscated due to coarse dark microtrichia; radial veins brownish; wing especially broad; costal ratio 0.85. Halter dark brown, knob intensely brown.

**Abdomen:** Dark brown; one pair of gland rods extending anteriorly the length of two body segments. Spermathecae (Fig. 48) two, slightly ovoid with short narrow necks, slightly unequal, 0.039 by 0.032 mm and 0.036 by 0.029 mm including neck.

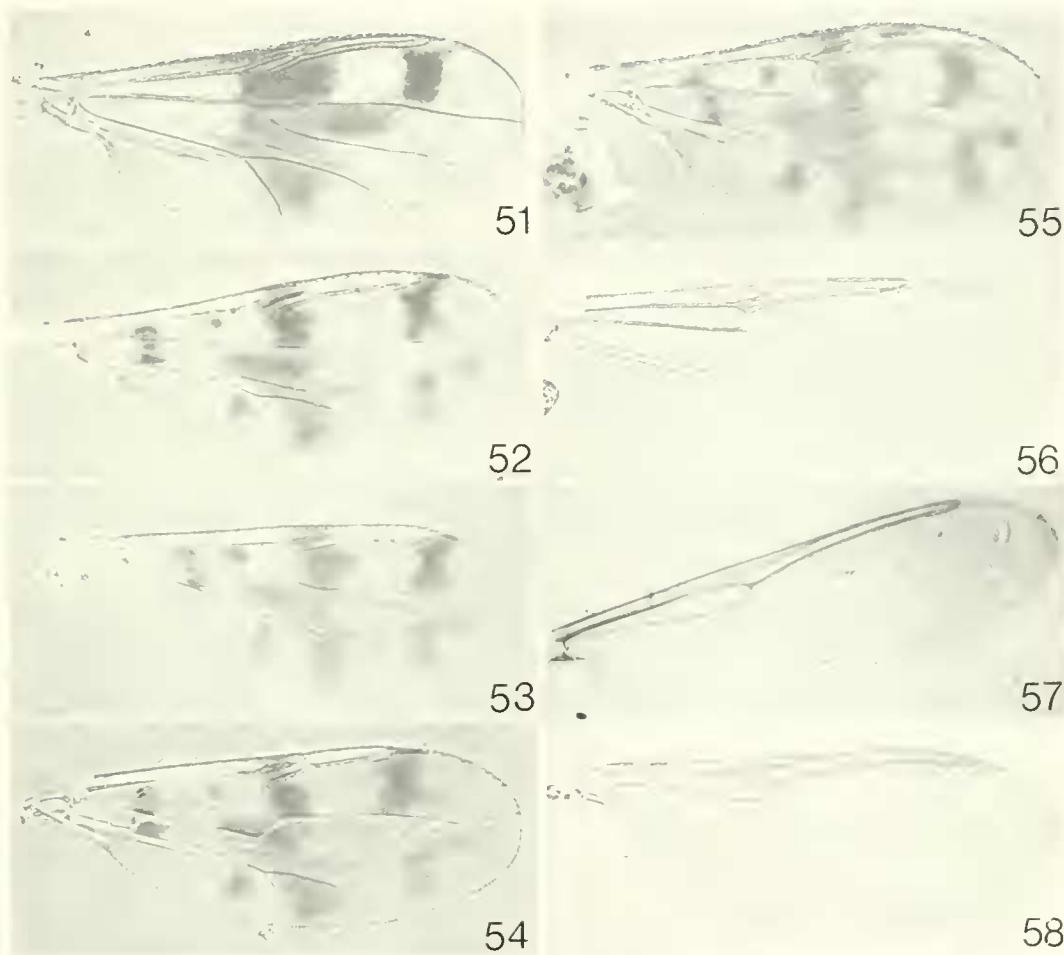
**Allotype male.**—Wing length 0.79 mm; breadth 0.32 mm; costal ratio 0.82.

Similar to the female with the usual sexual differences. Antennal plume very sparse and inconspicuous, pale brownish; flagellar segments with lengths in proportion of 20–10–10–9–8–8–9–10–13–22–22–25; antennal ratio 0.65. Palpus reduced to tiny globular segments; proportions 3–4–6–5–6. Hind leg with lengths from femur to tarsomere 5 as 106–94–52–23–13–7–13; palisade setae present only on tarsomeres 1 and 1 of hind leg, in two rows.

**Genitalia** (Fig. 50): Typical of the genus *Bezzia*; about as broad as long; ninth sternum short with shallow caudomedian excavation; ninth tergum short and convex, with long setose cerci. Basistyle short and tapering, without lobes; dististyle tapering irregularly to distal point. Aedeagus forming a nearly equilateral triangle; basal arms slender with low basal arch; distal process triangular, tapering to slender distal point. Parameres (Fig. 49) fused as usual in the genus; basal processes winglike with sharp anterior and lateral points; distal process long and spatuliform with slightly enlarged, rounded tip.

**Distribution.**—Fiji.

**Types.**—Holotype female, allotype male, Viti Levu, 14 km w Lami, 7–10.xii.1986, R. L. and B. B. Brown, UV light trap.



Figs. 51-58. Wings of Ceratopogonidae: 51, *Downshelea stenochora*; 52, *Monohelea beaveri*; 53, *M. coloistvae*; 54, *M. fijiensis*; 55, *M. leveri*; 56, *Stilobezzia browni*; 57, *Nilobezzia fijiensis*; 58, *Bezzia vitilevuensis*.

**Discussion.**—The specific name is from Viti Levu, the island where the species was taken. *Bezzia vitilevuensis* is readily distinguished from all other *Bezzia* species of the Oriental and Australasian Regions by the combination of uniformly dark brown femora and tibiae and lack of femoral armature.

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